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7 February 2006

TO: Seth L. Willey
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FROM: David M. Armstrong, Professor
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RE: Report by King *et al*. (2006)

Thank you for the opportunity to read the report, "Comprehensive Analysis of Molecular Phylogeographic Structure among the Meadow Jumping Mice (*Zapus hudsonius*) Reveals Evolutionary Distinct Subspecies," by T. L. King *et al*. (2006).

I am not a molecular systematist or phylogeographer so will not presume to evaluate laboratory, analytic, or statistical methods. I do have a modest amount of experience "on the ground" with the meadow jumping mouse, in Boulder and Larimer counties, Colorado, and a considerable amount of experience with small mammals in general, in habitat apparently suitable for the meadow jumping mouse, in both Colorado and northeastern Wyoming.

I agree strongly with King *et al*. (2006:3) that "an integrative conservation approach that identifies and sustains ecological processes and evolutionary lineages is needed…." This includes the identification, description, understanding, and protection of evolutionary and ecological patterns and processes including migration (historical and on-going), expansion, contraction, colonization, local extinction, and human impacts. That interdisciplinary perspective was lacking in the paper by Ramey *et al*. (2005), the methods and conclusions of which King *et al*. (2006) was intended to test.

Like Ramey *et al*. (2005), this is a targeted evaluation of the genetic distinctiveness of some putative subspecies; it is neither a thorough phylogeographic study of an entire species nor a taxonomic revision. Unlike Ramey *et al*. (2005), however, King *et al*. (2006) is based on considerably larger samples of individuals and larger fragments of genetic material. Further, data

were obtained from recently live-trapped animals or new or recent tissue samples rather than mostly from museum study skins, variable in age and preservation.

Because data sources and analytic methods are not the same, in a sense we are asked to compare incomparables ("apples and oranges"), but King *et al*. (2006) were keenly aware of that and contrast their methods with those of Ramey *et al.* (1995) repeatedly and pointedly.

King *et al*. (2006) demonstrated significant genetic differences between meadow jumping mice from northeastern Wyoming and adjacent South Dakota and mice from north-central Colorado. That is interesting, but not particular surprising, because there is a significant area of east central Wyoming that seems to be unsuitable as habitat for the meadow jumping mouse, at least at the present time.

King *et al*. (2006) presented no genetic data for southeastern and east-central Wyoming. It is not clear whether sampling was done in that area. Certainly any available information on the genetics of mice from southeastern Wyoming would be of interest. One would predict that they would cluster with mice from adjacent Larimer County, Colorado, but hard data are essential to test that prediction.

Lack of information about the presence of meadow jumping mice in east-central Wyoming was a critical flaw in the argument of Ramey *et al*. (2005), who concluded that *Z. h. preblei* was indistinguishable from *Z. h. campestris* of the Black Hills region but did not answer the obvious questions: whether the populations are in reproductive continuity with each other or how recently that presumed continuity was broken. If the populations are geographically isolated it would be interesting to know whether that isolation dates to post-glacial warming and drying, the Hypsithermal Interval, or perhaps the dramatic but much more recent ecological changes wrought in the late 19th Century by open range livestock grazing in the region.

I would like to have seen a note in Table 1 (King *et al*., 2006) as to which (if any) of the tissue samples were also tied to standard museum specimens and the repository of same.

Overall, I found the report by King *et al.* (2006) to be well-reasoned, thorough, well-written, and convincing. It is a homely principle of science that we need to "follow the data where they lead." It is also true that the more data there are and the more reliable those data are the better the "leadership" the data can provide.

On that common-sense basis, this unpublished report by King *et al.* (2006) is a far more useful document than Ramey *et al*. (2005). I hope King *et al*. (2006) will be published soon in the open, peer-reviewed scientific literature.

Literature Cited

King, T. L., *et al*. 2006. Comprehensive analysis of molecular phylogeographic structure among the meadow jumping mice (*Zapus hudsonius*) reveals evolutionarily distinct subspecies. Unpublished report to US Fish & Wildlife Service, 51 pp. + figures.

Ramey, R. R., II, H.-P. Liu, C. W. Epps, L. M. Carpenter, and J. D. Wehausen. 2005. Genetic relatedness of the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) to nearby subspecies of *Z. hudsonius* as inferred from variation in cranial morphology, mitochondrial DNA and microsatellite DNA: implications for taxonomy and conservation. Animal Conservation, 8:329-346.